9.0 ALTERNATIVES

The following sections discuss alternatives to the Power Pico Power Project (PPP) as proposed in this AFC. These include the "no project" alternative, power plant site alternatives, linear facility route alternatives, technology alternatives, water supply alternatives, and waste water disposal alternatives. These alternatives are discussed in relation to the environmental, public policy, and business considerations involved in developing the project. The main objective of the PPP is to produce economical, reliable, and environmentally sound electrical energy and ancillary services within Silicon Valley Power's service area.

The Energy Facilities Siting Regulations (Title 20, California Code of Regulations, Appendix B) guidelines titled *Information Requirements for an Application* require:

> *A discussion of the range of reasonable alternatives to the project, including the no project alternative… which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and an evaluation of the comparative merits of the alternatives.*

The regulations also require:

> *A discussion of the applicant's site selection criteria, any alternative sites considered for the project, and the reasons why the applicant chose the proposed site.*

9.1 PROJECT OBJECTIVES

The basic objectives of the PPP project are discussed throughout this application. Some of the key project objectives include the following:

- To provide economical, clean, and efficiently generated energy to the City Santa Clara's ratepayers
- To meet the projected growth in industrial demand for electricity
- To economically replace power supply that will no longer be available due to the expiration of an existing power supply contract in 2005 that represents approximately 25 percent of SVP's load
- To benefit the electrical supply and transmission system within the City of the Santa Clara and the Silicon Valley area by providing system reliability and transmission congestion benefits
- To locate the generating station near the sources of demand for maximum efficiency and system benefit

The CEC has determined that California will need a substantial amount of additional baseload generation capacity over the next several years to meet growing demand and to relieve upcoming shortages and provide a stable energy supply to Californians at a reasonable cost. The PPP will provide reasonably priced power to the City's ratepayers to help meet the City's growing demand for electricity and to help replace nuclear and fossil fuel generation resources retired due to age or cost of producing power. It will enhance the reliability of the state's electrical system by providing baseload power generation near the centers of electrical demand.

9.2 THE "NO PROJECT" ALTERNATIVE

If the Applicant were to not build the PPP (the “no project” alternative), it would not be possible to meet the project objectives. The “no project” alternative would forego all of the benefits associated with the PPP project. In addition, the "no project" alternative would result in more energy production from existing power plants than would otherwise occur, and these currently include older, less efficient, and less environmentally sound generating units. Most importantly, Silicon Valley Power, as a municipal utility, would fail to meet the existing and expected electrical load requirements of its ratepayers in the City of Santa Clara under the no project alternative. This would have major negative economic consequences for the City's commercial rate-payers and for the City's economy as a whole, since the City would be required to contract for power at greater expense from outside entities in order to meet the expected growth in demand as well as to replace the existing contractual supply.

In summary, the "no project" alternative would not serve the growing needs of Santa Clara's and California’s businesses and residents for economical, reliable, and environmentally sound generation resources.

9.3 POWER PLANT SITE ALTERNATIVES

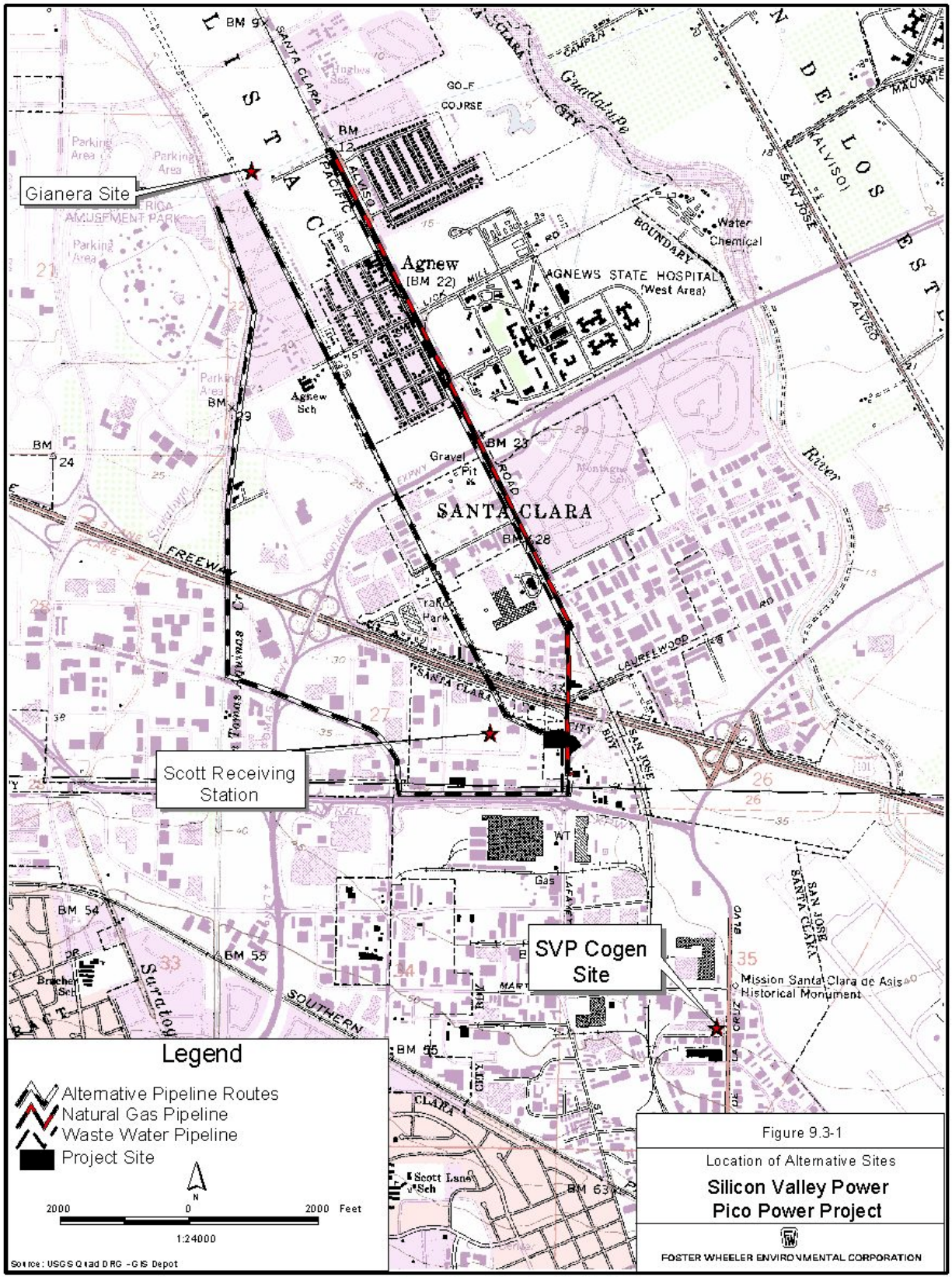
For comparison purposes, and to meet the requirements of CEQA and Title 20, alternative sites were chosen that could feasibly attain most of the project’s basic objectives. The alternative sites are shown in Figure 9.3-1.

The key siting criteria in considering these alternatives and the proposal PPP site included the following factors:

- Location more than 1,000 feet from the nearest residential uses or other sensitive receptor
- Location near the centers of electrical demand
- Land zoned for industrial use or heavy industry
- Location near a sufficient source of cooling water, preferably treated waste water
- Location near electrical transmission facilities
- Location near reliable natural gas supply
- A parcel or adjoining parcels of sufficient size for a power plant
- Site control (lease or ownership) feasible
- Feasible mitigation of potential environmental impacts

9.3.1 Proposed Pico Power Plant Site

The proposed site for the PPP on Duane Avenue in Santa Clara, California meets all of the project’s objectives and, in addition, would have no significant, unmitigated, environmental impacts. The site is a 2.86-acre area located in Santa Clara, California on Duane Avenue near the intersection of Lafayette Street and Central Expressway. The project would be sited at a currently vacant lot immediately north of the SVP Kifer Receiving Station. The lot is used for utility lineman training and as a site for cleaning street sweeping equipment.


Gianera Site
Scott Receiving Station
SVP Cogen Site
Agnew
(BM 22)
AGNEWS STATE HOSPITAL
(West Area)
SANTA CLARA
Mission Santa Clara de Asis
Historical Monument
Legend
Alternative Pipeline Routes
Natural Gas Pipeline
Waste Water Pipeline
Project Site
2000 0 2000 Feet
1:24000
Source: USGS Quad DRG - GIS Depot
Figure 9.3-1
Location of Alternative Sites
Silicon Valley Power
Pico Power Project
FOSTER WHEELER ENVIRONMENTAL CORPORATION

This site was chosen, among other things, because it is:

- Located near the centers of electrical demand from SVP customers
- Located adjacent to a source of reclaimed waste water sufficient for plant cooling (a reclaimed water pipeline is located on the project site) such that a lengthy pipeline would not be necessary, thus reducing environmental effects
- Located near transmission facilities, such as the Kifer Receiving Station, making it unnecessary to construct significant new transmission facilities, thus reducing environmental effects
- Zoned Public/Quasi-Public, which includes electrical utility uses and meets all City zoning requirements
- Located one-half mile from the nearest residential area and one-half mile from sensitive receptors
- Located approximately two miles from a readily available gas supply through the PG&E system
- The project site is owned by the City of Santa Clara

9.3.2 Alternative Site A: Gianera Generation Plant

Alternative site A is located within an 11-acre parcel between Centennial Boulevard, Lafayette Street, and the San Francisco 49er professional football team headquarters. The site is currently owned by SVP and contains two 24 MW GE gas turbines (SVP's Gianera Generation Plant) and two 4.5 million gallon water storage tanks. The eastern and southern borders of the parcel contain an electrical transmission right-of-way with four PG&E 115 kV transmission lines on two double-circuit towers. Gianera Street contains a PG&E 24-inch gas pipeline main, and a 6-inch gas line, tapped off of the main gas pipeline, runs along the southern border leading to the Gianera power plant. The eastern border of the parcel has a large reclaimed water main that can carry up to 10 million gallons daily. Key characteristics of the site are as follows:

- Reclaimed water, natural gas, and electrical transmission lines are located on or near the site
- The SVP Northern Receiving Station is located on-site
- The site contains an existing electrical generating substation
- Located near SVP customer load

9.3.3 Alternative Site B: Scott Receiving Station

Alternative site B is located on 6 acres near Space Park Drive and Raymond Street. The eastern portion (4 acres) is currently used for the SVP Scott 115/60 kV Receiving Station. The remaining portion (2 acres) is currently unused. There is an 8- or 12-inch gas pipeline along Space Park Drive. A reclaimed water main is located approximately 1,200 feet east of the property along Lafayette Street.. Two 115 kV transmission lines are located on the property, along with multiple 60 kV lines. Key characteristics of the site are as follows:

- Located within an industrial park
- Reclaimed water, natural gas, and electrical transmission lines are located on or near the site
- Currently owned and operated by SVP as an electric substation
- Location near SVP customer load

9.3.4 Alternative Site C: SVP Cogeneration Plant

Alternative site C is located near Robert Avenue and De La Cruz Boulevard. The current property, which is 326 feet by 173 feet, has a 7 MW combined-cycle plant that provides steam to California Paperboard and energy to SVP. A major reclaimed water line and a PG&E natural gas main are in close proximity to the plant. A small- to medium-sized power plant could be installed next to the existing cogeneration plant, which would subsequently be removed. However, existing electrical transmission lines would be insufficient to serve a power plant of this nature. Key characteristics of the site are as follows:

- Located within an industrial park
- Reclaimed water and natural gas are located on or near the site
- Currently owned by SVP
- Location near SVP customer load

9.4 COMPARATIVE EVALUATION OF ALTERNATIVE SITES

In the discussion that follows, the sites are compared in terms of each of the 16 topic areas required in the AFC, as well as in terms of project development constraints. The most useful topics for comparison are as follows:

- **Project Development Constraints**—Are there site characteristics that would prohibit or seriously constrain development, such as significant contamination problems, or lack of fuel, transmission capacity, or water?
- **Land Use Compatibility**—Is the parcel zoned appropriately for industrial use and compatible with local land use policies? What is the distance to the nearest residential area? What is the distance to sensitive receptors?
- **Routing and Length of Linear Facilities**–Can linear facilities be routed to the site along existing transmission lines, pipelines, and roads? Will linear facilities be significantly shorter for a given site?
- **Water Supply**—Is a supply of recycled water readily available such that it is not necessary to use potable water for all or part of the cooling water?
- **Visual Resources**—Are there significant differences between the sites in their potential for impact on valuable or protected viewsheds?
- **Biological Resources**—Would there be significant impacts to wetlands or threatened or endangered species such that mitigation of these effects would be unduly expensive or constrain the supply of available mitigation resources?
- **Contamination**—Is there significant contamination on site, such that cleanup expense would be high or such that cleanup would cause significant schedule delay?
- **Noise**—Is the site sufficiently near to a residential or recreation area such that it would be difficult to mitigate potential noise impacts below the level of significance?
- **Use of Previously Disturbed Areas**—Has the site been previously disturbed? Does the site minimize the need for clearing vegetation and otherwise present low potential for impact on biological and cultural resources?
- **Other Environmental Categories**—Are there significant differences between the sites in their potential for impact in other environmental categories?

Table 9.4-1 compares the alternatives sites in terms of their basic site characteristics.

There is no precise mathematical weighting system established for considering potential impacts in alternatives analyses. Some of the criteria used to compare the alternatives are more or less important to consider than others. For example, an impact that could affect public health and safety or could result in significant environmental impacts is obviously of greater concern than a purely aesthetic issue associated with an advisory design guideline. It is important in comparing alternatives to focus on the key siting advantages and the potential adverse environmental effects of a particular site. Comparing each of the environmental disciplines and giving each discipline equal weight would provide a misleading analysis because effects in one area are not necessarily equivalent in importance to effects in another area.

Table 9.4-1. Characteristics of the alternative sites.

Site or Alternative	Pico Power Project Site	Alternative A Gianera Site	Alternative B Scott Receiving Station	Alternative C SVP CoGen Site
Acreage available for building	2.86 acres	2.18 acres	2 acres	1.29 acres
Number parcels	9	2	1	1
Current use	Electrical substation/ equipment cleaning	Electrical substation	Electrical substation	Cogeneration plant
Previously disturbed area	Yes	Yes	Yes	Yes
Distance to nearest sensitive receptor	0.5 miles	0.38 miles	0.30 miles	1 mile
Distance to nearest residence	0.5 miles	100 feet	0.75 miles	1 mile
Transmission line	On site	On site	On site	Requires upgrade or construction of new lines
Water supply pipeline	On site	On site	1,200 ft	In close proximity
Natural gas line	2 miles	On site	3-4 miles	On site
Recycled water available	Yes	Yes	Requires construction of a pipeline	Yes
Zoning	Public/Quasi Public	Public/Quasi Public	Light Industrial	Heavy Industrial
Height limit	Yes	No	No	Yes
Agricultural conversion	No	No	No	No
Contamination	Not identified	Unknown	Unknown	Unknown

For example, though the sites may differ in terms of available local road and street capacities and the current levels of traffic congestion, the number of workers during the operational phase of the project is low and would be unlikely to have a significant effect on local traffic. The sites may differ widely in the amount of traffic congestion they would cause during construction, but this is a temporary impact and should not be a strong consideration in site selection, as long as measures to mitigate this impact are

feasible. The sites would not differ significantly in terms of geological hazards, though close proximity to a major fault would call for more rigorous and expensive seismic engineering. Hazardous materials handling and worker health and safety issues would be the same or nearly the same for most sites. Though the risk of a release of hazardous materials during transport might be seen as more or less likely depending on location (roadway hazards, in particular), the record of safe transport and handling of such materials is clear. Further, the sites considered here are all in or near urban areas that are served by good transportation networks and are close to the sources of supply.

Similarly, project effects on paleontological and cultural resources are not often consequential in comparing alternatives. Once an initial screening for effects on highly significant sites is completed, the probabilities of encountering hidden paleontological or cultural resources during construction are difficult to calculate or compare.

9.4.1 Project Development Constraints

As indicated in the introductory descriptions of each of the alternative sites, the basic needs of power plant siting for land, access to electrical transmission, gas supply, and cooling water, are met at each of the alternative sites. There are, however, some differences between the sites.

For example, the proposed PPP project site would involve construction of a pipeline (approximately 2 miles) to supply natural gas. Use of the Scott Receiving Station site would also require construction of a natural gas pipeline. The Gianera and SVP Cogen sites are currently supplied by existing natural gas pipelines. While three of the sites have access to electrical transmission lines on-site, the SVP Cogen site would require either upgrading the existing lines or construction of new lines to a substation. While both the PPP site and the Gianera site have access to a reclaimed water line on-site, the Scott Receiving Station and the SVP Cogen sites would require construction of a reclaimed water pipeline.

Although there is sufficient land at each of these locations to develop a project, the SVP Cogen and the Gianera sites are much more space-constrained that the Scott and Pico sites, with only a few hundred feet of space available, possibly leaving a site too small for a power plant that would meet SVP's project objectives.

Parcel consolidation is required for the PPP project site, but will not be an obstacle. The PPP project would be located on part of a City-owned block of land that includes nine individual parcels. A parcel map allocation (also known as a "reversion to acreage") would need to be filed with the City of Santa Clara to convert the nine separate parcels into a single parcel before construction starts.

9.4.2 Air Quality

The quantity of emissions from project operation would be the same at any of the sites. Each of the sites is located in the Bay Area Air Quality Management District and would, therefore, be subject to the same review, emission reduction crediting, and permitting requirements. Each site is located in relatively flat terrain that will help to promote dispersion of emissions. Small differences between the sites in distance from the nearest residences should not make a significant difference in air quality impacts at these residences. Mitigation would bring any potential impacts to a level below significance for any of the alternatives.

9.4.3 Biological Resources

The PPP site currently contains some open field and a drainage ditch, but does not contain wildlife habitat for protected species. The other three alternative sites are located on developed, previously disturbed ground. There does not appear to be habitat for protected species.

For the PPP, Gianera, and Scott alternatives, electrical transmission facility construction would be limited to adding or upgrading on-site switchyards. There would be little or no resulting effect on plants or wildlife. The SVP Cogen site would require either upgrading the existing lines or construction of new lines to a substation, which could increase the potential for effects on plants or wildlife.

All four sites would need to address the issues of nitrogen deposition, in the form of natural gas combustion by-products and unreacted ammonia from the emission control system, which may adversely impact serpentine habitats in south of the project sites. Soils developed on serpentine rock provide habitat for several federally listed endangered endemic plant species, as well as the Bay checkerspot butterfly. The issue of nitrogen deposition impacting serpentine habitats requires the preparation of a biological assessment for submittal to the U.S. Fish and Wildlife Service.

9.4.4 Cultural Resources

There would be few significant differences in cultural resources among the PPP, Gianera, and Scott alternatives, based on current information. Known archaeological sites would not be directly affected (buried sites are possible in any location). There would be a greater possibility of encountering buried archaeological deposits with the alternatives that would involve longer underground linear appurtenances (such as water and gas lines). The SVP Cogen site lies approximately 1,400 feet west of a previously recorded multi-component historic and prehistoric archeological site.

9.4.5 Geological Resources and Hazards

There would be no significant differences between the sites in terms of geological resources and hazards. There are no geological resources located at or near any of the sites. All four sites are located within 5 to 17 miles of four active fault zones: the San Andreas, Sargent, Hayward (southern extension), and Calaveras. Seismic hazards and potential adverse foundation conditions will be minimized by conformance with the recommended seismic design criteria of the California Building Code (CBC [1998]) Seismic Zone 4 requirements. In addition, the facility arrangement is such that no major structures or equipment are within the projected trace of any active or potentially active faults.

9.4.6 Hazardous Materials Handling

There would be no significant difference between the site locations in terms of hazardous materials handling. The uses of hazardous materials would be the same for any of the sites. Though there might be differences in the distances that trucks carrying hazardous materials would travel to deliver the materials, these differences would be minor and would not necessarily be consequential, given the effective mitigation measures available and the excellent safety record for transport of these materials.

9.4.7 Land Use

Each of the four sites is zoned appropriately for industrial use. The PPP site, which lies within the City of Santa Clara, is zoned Public/Quasi-Public and is surrounded on the west by a Light Industrial district and on the east by a Heavy Industrial district. The Santa Clara Planning Division has stated that an electrical power plant is an appropriate use within the Public/Quasi-Public zone, as it will provide the general

public with a needed service. Since the proposed use falls directly into one of the categories of permitted uses, a Conditional Use Permit will not be required. However, the PPP project would be located on a larger, City-owned holding that consists of nine individual and separate parcels, and while the City of Santa Clara owns all of the parcels in question, buildings are not permitted to cross parcel boundaries, regardless of ownership. A parcel map allocation (reversion to acreage) would need to be filed with the City of Santa Clara to convert the nine separate parcels into a single parcel. The proposed project site is located approximately 3,800 feet west of Runway 12R/30 at the San Jose International Airport. Since the HRSG stacks will exceed the 70-foot height limit for buildings in the Light Industrial District, consultation with the Santa Clara County Airport Land Use Commission (ALUC) regarding consistency with the Airport Land Use Plan would be required.

The Gianera site is also zoned Public/Quasi-Public. A residential housing development is located 100 feet to the south. Open land, slated for expansion of the SVP Northern Receiving Station, lies to the east. The San Francisco 49er professional football team headquarters and practice facility lie to the northeast. The San Tomas Aquino Creek lies to the west and, further west on the opposite side of the Creek is the Great America amusement park.

The Scott site is zoned Public/Quasi-Public and is surrounded by Light Industrial development that includes high technology manufacturing and office uses, and communications buildings (internet and telephone switching stations and service centers).

The SVP Cogen site is zoned Heavy Industrial and is surrounded by both Light and Heavy Industrial development. The existing cogeneration plant is located at a large paperboard processing facility. The San Jose International Airport lies to the east, across De La Cruz Boulevard.

9.4.8 Noise

The Gianera site is approximately 100 feet from a residential housing development. This could pose a problem for power plant construction and operation at this site. By using appropriate baffling and sound walls, the project could meet standards for industrial zoning at the property line (70 dBA L_{dn}), though at considerable expense. Meeting the noise standards in the City's zoning ordinance, however, for residential uses (55 dBA L_{dn}), would be very difficult.

The Scott Receiving Station and SVP Cogen sites are at least 0.30 miles from the nearest receptor and 0.75 miles from the nearest residential housing area. The PPP site is 0.5 miles from both the nearest residential area and the nearest sensitive receptor. With appropriate shielding and sound walls, these three sites should be able to meet community noise standards in the City's zoning ordinance.

9.4.9 Paleontology

There would be no significant differences between the project sites in terms of potential effects on paleontological resources. None of the sites is located at a known paleontological find spot, though Pleistocene fossils have been found in the alluvial deposits of the Santa Clara Valley. The probability of encountering significant fossils is approximately the same at all sites.

9.4.10 Public Health

The project would not be likely to cause significant adverse long-term health impacts (either cancer or non-cancer) from exposure to toxic emissions, regardless of the site chosen.

9.4.11 Socioeconomics

All four sites are located in Santa Clara County. The number of workers, construction costs, payroll, and property tax revenues would be nearly the same for the project at each of the sites. The majority of the workers would come from the cities of San Jose and Santa Clara. Most workers would commute daily or weekly to the plant site. Some may move temporarily to the local area during construction, causing site-specific impacts to schools, utilities, and emergency services. These impacts would be temporary. Disproportionate impacts to minority and low income populations would be unlikely since minority populations are not concentrated in an area or areas that are also high potential impact areas. The project is not likely to cause significant adverse public health impacts to areas that are disproportionately minority or low income.

9.4.12 Soils and Agriculture

There would not be significant differences between the alternative sites in terms of their potential effects on soils and agriculture. None of the sites would result in the loss of prime and unique farmlands or farmlands of statewide importance.

9.4.13 Traffic and Transportation

Though there are differences between the project sites in terms of the amounts of current traffic congestion in their immediate areas, each of the sites is located in an urban area with relatively congested local traffic and near access to major freeways that are also relatively congested. The number of employees working at a given time during project operation (approximately 15) will not significantly impact local traffic conditions at any of the sites. The peak number of employees during construction (206) will have much more impact, but the impact will be temporary, and can be mitigated by providing off-site parking and busing for workers during peak periods. The effect on construction-phase traffic, therefore, should not figure as a major consideration in evaluating or comparing the sites. Access to the Gianera site on Gianera Street would be more disruptive in general, since it would take place through a residential street and, during the construction period, would cause a significant increase in traffic on this street. Existing traffic on the street, however, is small.

9.4.14 Visual Resources

The project at each of these sites would be visible to a large number of viewers. Visual impact depends on the quality of the view that is changed or affected by a given project's features, as well as the sensitivity of the viewers. Viewsheds that contain significant natural landmarks or features are of high quality. Residential and recreational viewers are considered more sensitive viewers than others.

9.4.14.1 Pico Project Site

The PPP site is located in a densely developed, industrial area with many large structures. Viewsheds do not include significant natural features in the foreground or middleground in any direction. The adjacent parcel is the Kifer Receiving Station, where several transmission lines converge. Major nearby visual features include the very large Owens-Corning fiberglass insulation manufacturing plant to the south at the corner of Lafayette and Central Expressway. This is a very large and tall structure, with several small stacks protruding from the roof to heights of 80 or 90 feet. The Bayshore Freeway (US 101) is 400 feet to the north of the project, but is visible only from the Lafayette Street overpass just northeast of the Pico site.

Viewers travelling through this area are mostly commuters on journeys to work. The site is visible from Lafayette Street northbound and southbound, from lightly used feeder streets in the industrial area to the west and, briefly, from the Bayshore Freeway. Because of the similarity of the project to nearby structures, the low quality of the existing viewshed, and the low sensitivity of viewers, potential impacts to visual resources are low.

9.4.14.2 Gianera Site

The Gianera site is located in a viewshed that includes somewhat open views to the east, through the Hetch Hetchy aqueduct right-of-way and open land reserved for SVP's Northern Receiving Station. The area to the northeast is also somewhat open due to the presence of the San Francisco 49er training facility. The area to the west and northwest contains the Great America Amusement park and its parking lots. Immediately west is the San Tomas Aquino Creek corridor. To the south is a residential area. Several large transmission lines cross this area from north to south. There are no significant natural landmarks or features in the area.

A power plant project at the Gianera site with 95-foot-tall stacks could be seen from portions of the residential area to the south, from the recreational trails along the San Tomas Aquino corridor to the west, and from elevated rides at the Great America theme park. Though these would all be considered sensitive viewers, more detailed analysis of distance, dominance, existing viewshed quality, and numbers of viewers affected would be necessary to determine whether or not the visibility of the project stacks and HRSGs could be considered a significant environmental impact under CEQA.

9.4.14.3 Scott Receiving Station

The Scott Receiving Station is located in an area zoned Light Industrial and is surrounded by two- and three-story manufacturing and office buildings. As and electrical facility, the Scott site is served by several large transmission lines, adding to the industrial character of the surrounding viewshed. A power plant at the Scott Site could be seen by viewers along Space Park Drive and portions of Central Expressway. Because these viewers are mostly commuters; the power plant would fit into the existing viewshed, which includes the Owens-Corning fiberglass manufacturing plant and Kifer and Scott Receiving stations; and there are no significant natural landmarks or features in the viewshed; there would be no significant impact on visual resources.

9.4.14.4 SVP Cogeneration Plant

The SVP Cogen site is located with the City's heavy industrial area. Key visual features near the site include the California Paperboard manufacturing plant, to which the existing SVP Cogen project provides manufacturing process steam, and the nearby San Jose International Airport. Viewshed quality in this area is low. The project could be seen from locations on De La Cruz Boulevard and several feeder streets. Viewers in this area, however, are mostly commuters, so the viewer sensitivity would be low. There are no natural landmarks or features in the vicinity that the project would block. Significant visual resources impacts would be unlikely.

9.4.15 Water Resources

All four sites would be able to use treated waste water for power plant cooling and therefore would not differ significantly in their use of water resources. This is consistent with the State Water Resources Control Board's Policy 75-58 indicating that water for power plant cooling should avoid using fresh inland waters if other waters (such as treated waste water) are available.

9.4.16 Waste Management

The management of wastes would differ between the project site and the three alternatives, though these differences would not necessarily lead to a site preference. The proposed PPP site is currently vacant. This means there would be a smaller quantity of waste generated during demolition to prepare for construction. By contrast, the Scott Receiving Station site would require demolition of the equipment associated with a 2 MW fuel cell demonstration project. The SVP Cogen site would require demolition of the existing cogeneration plant following construction of the new power plant, and the Gianera Site would require conversion of combustion turbines to combined cycle.

9.4.17 Summary and Comparison

Returning to our original site selection criteria as described in Section 9.3, it is clear that power plant siting is feasible at most of these alternative sites. A summary of environmental and project development constraints is presented in Table 9-2.

- **Location more than 1000 feet from the nearest residential receptor**—The Gianera site is 100 feet from a residential housing development. The PPP, Scott, and SVP Cogen sites are all more than 1000 feet from the nearest residential or sensitive receptor.
- **Location near the centers of electrical demand**—All of the sites are in highly urbanized areas with residential and industrial demand for power.
- **Land zoned for industrial heavy industrial use**—The PPP and Gianera sites are zoned Public/Quasi-Public. A power plant is a permitted use in each of these zones. The Scott Receiving Station and SVP Cogen alternative site are zoned for Light Industrial and Heavy Industrial use, respectively.
- **Location near a sufficient source of cooling water, preferably treated waste water**—The San Jose/Santa Clara Water Pollution Control Plant can provide a sufficient quantity of waste water to cool a power plant of this size at any of these sites. A project at the Gianera, SVP Cogen, and PPP sites would be located adjacent to the water source, and would not require construction of a pipeline as the Scott Receiving Station site would.
- **Location near electrical transmission facilities**—The PPP, Scott Receiving Station, and Gianera sites are located on the site of a currently existing substation, and thus an electrical tie-in is available on-site. The SVP Cogen site would require either upgrading the existing lines or construction of new lines to a substation.
- **Location near ample natural gas supply—**Each of the sites is convenient to ample natural gas supply. All four sites would require construction of a pipeline (2 to 4 miles).
- **Parcel or adjoining parcels of sufficient size for a power plant—**There is sufficient land available at each parcel to develop a power plant; however, the Gianera and SVP Cogen sites are quite small (only a few hundred feet). This may mean that a power plant of the PPP's scale would not be feasible on this site or would present difficult engineering challenges.
- **Site control feasible—**The City of Santa Clara owns and controls each of the sites.
- **Mitigation of potential impacts feasible—**Mitigation of potentially significant environmental impacts appears feasible at the PPP and Scott sites. The Gianera site may cause significant adverse noise impacts that would be difficult, if not impossible to mitigate. The Gianera project may cause visual resources impacts, but these would likely be mitigable.

- **Site control feasible—**The City of Santa Clara owns and controls each of the sites.

The Gianera site may be fatally flawed because of its small size and proximity to high-density residential uses (100 feet) and the Great America theme park (approximately 1,500 feet).

The SVP Cogen site would likely require construction of new transmission lines capable of carrying the load from the power plant to a substation, as well as construction of a longer natural gas supply pipeline, thus increasing the cost of the project and increasing the possibility of environmental effects. This site may also be too small to permit development.

The Scott Receiving Station site would require construction of a recycled water pipeline, increasing the cost of the project and increasing the possibility of environmental effects. Using the Scott site for the power plant, however, would take up valuable space reserved for receiving station expansion, thus precluding the expansion at a later date. This would limit the functionality and reliability of the SVP transmission system in a way that would be difficult to overcome in the future.

Table 9.4-2. Environmental and project development constraints of the PPP and alternative sites.

Site or Alternative	Pico Site	Alternative A Gianera Site	Alternative B Scott Receiving Station	Alternative C SVP Cogen
Site control	Yes	Yes	Yes	Yes
Biological Resources:				
Wetlands	No	No	No	No
Protected species	No	No	No	No
Cultural Resources	No	No	No	No
Land Use and zoning	Permitted Use	Permitted Use	Permitted Use	Permitted Use
Sensitive noise receptors nearby	No	100 feet from nearest residence	No	No
Traffic	No	Construction traffic in residential area	No	No
Visual Resources	Existing substation	Possible conflict with residences, trail viewers, and Great America theme park	Existing substation	Existing power generating plant
Waste Management	Open lot (contamination not identified)	Existing substation (contamination unknown)	Existing substation (contamination unknown)	Existing power plant (contamination unknown)
Fatal Flaw or significant unmitigated impacts?	No	Yes	No	No

The PPP site has interconnections with recycled water and electrical transmission lines on-site; there is no habitat for any protected species; the site is located one-half mile from the nearest residential area and sensitive receptor; and the site is surrounded by industrial land uses. In addition, building at the PPP would not conflict with airport land uses or preclude the future expansion of SVP's transmission system.

In conclusion, the PPP site is the most feasible site with the lowest potential environmental impact, in comparison with the other alternatives.

9.5 ALTERNATIVE PROJECT DESIGN FEATURES

The following section addresses alternatives to some of the PPP design features, such as the locations of the natural gas supply pipeline, electrical transmission line, and water supply pipeline, and the radio broadcast tower relocation.

9.5.1 Alternative Natural Gas Supply Pipeline Routes

Natural gas fuel for the PPP will be supplied by Pacific Gas and Electric (PG&E) by a 12-inch pipeline from a major gas distribution line (Line 132) at Gianera Street and Wilcox Avenue. A detailed study of alternative natural gas pipeline routing and construction alternatives is found in Appendix 5-A.

9.5.1.1 Selection Criteria

In general, the alternative routes for the gas supply pipeline were selected based on engineering and construction feasibility, the expected delivery pressure of the natural gas supply, length of pipeline, cost, and the potential for environmental impacts. Engineering/construction feasibility is an assessment of whether the pipeline can be physically placed along a route. Length of pipeline is important because pressure drop, cost, and potential environmental impacts are usually functions of length. Environmental impacts must be either not significant or mitigatable to a level of insignificance.

No major differences between the routes evaluated were seen with regards to engineering and construction feasibility, the expected delivery pressure of the natural gas supply, length of pipeline, and cost to construct or operate. All routes included pipeline construction along city streets that involve temporary reduction or rerouting of traffic during pipeline construction and the potential for some temporary disruption of utility services.

Since all of the candidate routes follow City streets or otherwise previously disturbed surfaces within industrial areas, impacts to natural and/or cultural resources are not likely to be significant for any of the candidate routes. In addition, because the lengths of the candidate routes are of the same order of magnitude, noise, visual, air quality, and water quality impacts are not expected to differ significantly for the candidate routes. Pipeline construction impacts on traffic are seen as the most important environmental impact that allows discrimination between the alternates considered.

The natural gas pipeline route chosen for the project would begin at a new connection to PG&E natural gas main pipeline 132 in Gianera Street at Wilcox Avenue, approximately 1.7 miles north of the project site. From a metering station near this corner, located in the pedestrian passageway between Gianera Street and the open Hetch Hetchy aqueduct right-of-way to the north, the pipeline would cross under the Union Pacific Railroad (UPRR) tracks using horizontal directional drilling to Lafayette Street, to the east of the UPRR tracks. The pipeline would be constructed in Lafayette Street, in the outer southbound lane to Aldo Street. At this point, the pipeline would cross under the UPRR tracks using horizontal directional drilling or jack-and-boring techniques into Bassett Street. The pipeline will proceed south on Bassett to the corner of Laurelwood Road, at the Bayshore Freeway. The pipeline will cross under the freeway through a bored and jacked casing to Duane Avenue. It will then proceed down Duane to Lafayette to the compressor Station at Lafayette and Comstock. A second pipeline will cross Lafayette Street from the compressor site to the project.

The alternative gas pipeline routes are as follows:

- PG&E Transmission Corridor—This route would involve connecting to PG&E line 132 near the northwest end of Gianera Street at Lakeshore and following the PG&E electrical transmission corridor south-southeast through residential and commercial areas directly to the Kifer Receiving Station.
- San Tomas Aquinas Creek—The channelized creek corridor runs approximately 400 meters west of the PG&E electrical transmission line 14 and, south of US 101, is approximately one mile west of the PPP site.
- Union Pacific Railroad Easement—The UPRR railroad parallels Lafayette Street. This route would be very similar to the preferred route, except that the pipeline would be in the UPRR right-of-way instead of Lafayette Street between the connection point at Gianera Street and Aldo Street.

The PG&E transmission corridor is an existing utility corridor that leads directly to the project site. The most important liability associated with this route, however, is that both residential and commercial users have encroached on the right-of-way. Construction would therefore involve removing the encroaching uses (gardens, basketball courts, barbecue areas, parking and access areas, etc.). This would be likely to engender public opposition and possible delays.

The San Tomas Aquino Creek route would involve extensive environmental studies leading to possible mitigation for threatened and endangered species and wetlands. It is likely that construction in this area would be limited to the summer months, due to biological resources concerns. This route also poses some obstacles to constructability, because of slopes that would be unstable. Finally, this route would take the pipeline to a point south of US 101 that would still require a mile or more of pipeline construction. Overall cost of this route would be high due to the longer distance, permitting issues, and constructability.

The Union Pacific Railroad easement route would be similar in distance and environmental impact to the preferred route, except that there would be less disruption of traffic during construction. The cost, however, would be prohibitive due to the UPRR's easement costs of $21 per square foot or more. The project would require approximately 120,000 square feet.

9.5.2 Electrical Transmission System Alternatives

Silicon Valley Power plans to connect the PPP to the existing Scott-Kifer 115 kV transmission line at the SVP Kifer Receiving Station, located on-site. Since a transmission system adequate for the proposed project is already located on-site, no alternatives were considered.

9.5.3 Water Supply Alternatives

The San Jose/Santa Clara Water Pollution Control Plant will supply water for the proposed project as described in Section 7.0 through a pipeline on the Pico site. Other sources of water might include potable water from the City of Santa Clara system. Well water would be another possible source of cooling water. Recycled water is clearly the better alternative, however, because it provides a beneficial use for treated waste water which might otherwise be wasted and discharged into San Francisco Bay, thus exacerbating ecological problems stemming from excessive freshwater discharges to the bay from the surrounding urban area. Using potable water from either the City's system or on-site wells would involve consuming large quantities of scarce fresh water for power plant cooling that could be more beneficially used for other purposes.

9.5.4 Waste Water Disposal Alternatives

Waste water produced by the PPP will be disposed of to the City of Santa Clara sanitary sewer system through a pipeline from the project site to the City's main sewer line in Central Expressway south of the site. Since the City's sanitary sewer system has sufficient capacity to accept the project's waste water and because the project's waste water will meet the City's water quality standards for industrial discharges, no other disposal alternatives were considered.

In addition to alternatives that would use water for cooling, zero discharge was considered. A zero-discharge alternative has the potential for significant impacts that may or may not be reduced to a level of insignificance. These different impacts result, in part, from the fact that a zero discharge system would require the addition of several plant design features:

- Raw water pretreatment to soften the water and allow operation of the cooling tower at higher cycles of concentration, thereby reducing the volume of cooling tower blowdown produced.
- Process equipment employing evaporation and crystallization technology to reduce the volume of waste water and produce reusable water.
- Additional water reuse loops in the plant water management design.
- Sludge dewatering equipment and off-site sludge disposal.

Addition of the necessary processes and equipment to implement the zero discharge alternative would result in increased capital cost, increased operating and maintenance cost, additional auxiliary power consumption, and additional site space requirements. This alternative also significantly increases on-site chemical handling and storage requirements and produces large quantities of sludge that must be properly disposed of off-site. These disadvantages were found to outweigh the water saving advantage of the zero discharge alternative.

9.6 TECHNOLOGY ALTERNATIVES

The configuration of the PPP was selected from a wide array of technology alternatives. These include generation technology alternatives, fuel technology alternatives, combustion turbine alternatives, NO_x control alternatives, inlet air cooling alternatives, and heat rejection alternatives.

9.6.1 Generation Technology Alternatives

Selection of the power generation technology focused on those technologies that can utilize the natural gas readily available from the existing transmission system. The following provides a discussion of the suitability of such technologies for application to the PPP.

9.6.1.1 Conventional Boiler and Steam Turbine

This technology burns fuel in the furnace of a conventional boiler to create steam. The steam is used to drive a steam turbine-generator, and the steam is then condensed and returned to the boiler. This is an outdated technology that is able to achieve thermal efficiencies up to approximately 36 percent when utilizing natural gas, although efficiencies are somewhat higher when utilizing oil or coal. Due to this low efficiency and large space requirement, the conventional boiler and steam turbine technology was eliminated from consideration.

9.6.1.2 Simple Cycle Combustion Turbine

This technology uses a combustion turbine to drive a generator. Combustion turbines have relatively low capital cost, and aeroderivative units are able to achieve thermal efficiencies up to approximately 38 percent. Due to its quick startup capability and relatively low capital cost, this technology is used primarily in peaking application (less than 1,000 hours per year), where relatively low efficiency is not an overriding concern. Due to its relatively low efficiency, this technology tends to emit more air pollutants per kilowatt-hour generated than more efficient technologies. Due to less than optimal environmental performance and relatively low efficiency, the simple-cycle combustion turbine technology was eliminated from consideration.

9.6.1.3 Conventional Combined-Cycle

This technology integrates combustion turbines and steam turbines to achieve higher efficiencies. The combustion turbine's hot exhaust is passed through an HRSG to create steam used to drive a steam turbine-generator. This technology is able to achieve thermal efficiencies up to approximately 44 percent, considerably higher than most other alternatives. This high efficiency also results in relatively low air emissions per kilowatt-hour generated. For these reasons, the conventional combined-cycle is considered the benchmark against which all other base load and intermediate load technologies are compared. Due to its high efficiency and superior environmental performance, this technology was selected for the PPP as well as for most other new base load and intermediate load power plants being developed in the United States.

9.6.1.4 Kalina Combined-Cycle

This technology is similar to the conventional combined-cycle, except a mixture of ammonia and water is used in place of pure water in the steam cycle. The Kalina cycle could potentially increase combined cycle thermal efficiencies by several percentage points. However, because this technology is still in the development phase and has not been commercially demonstrated, it was eliminated from consideration.

9.6.1.5 Advanced Combustion Turbine Engines

There are a number of efforts to enhance the thermal efficiency of combustion turbines by injecting steam, intercooling, and staged firing. These include the steam injected gas turbine (STIG), the intercooled steam recuperated gas turbine (ISRGT), the chemically recuperated gas turbine (CRGT), and the humid air turbine (HAT) cycle. The STIG it less efficient than conventional combined-cycle technology, uses large amounts of de-ionized water and is only able to achieve thermal efficiencies up to approximately 40 percent. None of the remaining technologies, ISRGT, CRGT or HAT, is commercially available. Consequently, all of these technologies were eliminated from consideration.

9.6.2 Fuel Technology Alternatives

Technologies based on fuels other than natural gas were eliminated from consideration because they do not meet the project objective of utilizing natural gas available from the existing transmission system. Additional factors rendering alternative fuel technologies unsuitable for the proposed project are as follows:

- No geothermal or hydroelectric resources exist in Santa Clara County.
- Biomass fuels such as wood waste are not locally available in sufficient quantities to make them a practical alternative fuel and PPP site space is limited.

- Solar and wind technologies are generally not dispatchable and are therefore not capable of producing ancillary services other than reactive power, and PPP site space is limited.
- Coal and oil technologies emit more air pollutants than technologies utilizing natural gas.
- The availability of the natural gas resource provided by PG&E, as well as the environmental and operational advantages of natural gas technologies, make natural gas the logical choice for the proposed project.

9.6.3 NO_x Control Alternatives

To minimize NO_x emissions from the PPP, the CTGs will be equipped with water injection combustors and the HRSGs will be equipped with post-combustion selective catalytic reduction (SCR) using aqueous ammonia as the reducing agent. The following combustion turbine NO_x control alternatives were considered:

- Steam injection (capable of 25 to 42 ppm NO_x).
- Water injection (capable of 25 to 42 ppm NO_x).
- Dry low NOx combustors (capable of 15 to 25 ppm NO_x).

Water injection was selected because it allows for lower acceptable NO_x emissions while being able to achieve an output turndown rate of 30 percent. This turndown is necessary to meet the variable SVP load demand.

Two post-combustion NO_x control alternatives were considered:

- SCR.
- SCONOx

SCR is a proven technology and is used frequently in combined cycle applications. Ammonia is injected into the exhaust gas upstream of a catalyst. The ammonia reacts with NO_x in the presence of the catalyst to form nitrogen and water.

$SCONO_x$™ is a new technology and has been installed on a 25 MW combined cycle plant since December 1996. $SCONO_x$™ consists of an oxidation catalyst, which oxidizes CO to CO_2 and NO to NO_2. The NO_2 is adsorbed onto the catalyst, and the catalyst is periodically regenerated. Although a potentially promising technology, $SCONO_x$™ has not been commercially demonstrated on a large power plant. There are several technological and commercial issues remaining to be resolved prior to application of this new technology to the class of large combustion turbines selected for the proposed project.

The following reducing agent alternatives were considered for use with the SCR system:

- Anhydrous ammonia
- Aqueous ammonia
- Urea

Anhydrous ammonia is used in many combined cycle facilities for NO_x control, but is more hazardous than diluted forms of ammonia. Aqueous ammonia (a 19 percent ammonia, 81 percent water solution) is proposed for the PPP because of its safety characteristics. Urea has not been commercially demonstrated for long-term use with SCR and was therefore eliminated from consideration.

9.6.4 Inlet Air Cooling Alternatives

Combustion turbine output and efficiency both increase as inlet air temperature decreases. Ambient air temperatures for the proposed project are sufficiently high for a large portion of the year to warrant some form of inlet air cooling. Two common forms of combustion turbine inlet air cooling are evaporative cooling and air chilling.

Evaporative cooling is capable of cooling to temperatures near the ambient wet-bulb temperature. Air chilling is capable of cooling to temperatures far below the ambient wet-bulb temperature, and it is able to maintain a low temperature over a wide range of ambient conditions. Air chilling uses mechanical or absorption refrigeration to produce a cold fluid for cooling the inlet air. Air chilling has a greater capital cost than evaporative cooling, but is able to cool the inlet air over a greater range. Air chilling systems may be designed to operate continuously or they may be designed to produce ice or cold water during off peak periods for cooling of the inlet air during peak periods.

Based on temperature profiles at the proposed site, inlet air chilling was selected for the PPP to optimize output and efficiency versus capital cost.

9.6.5 Heat Rejection Alternatives

The PPP will employ a surface condenser cooled by circulating water, with heat rejection provided by a mechanical draft, wet cooling tower. An air-cooled condenser was considered as an alternative. The wet cooling tower was found to be the most cost-effective heat rejection system and produces the highest plant efficiency.

The advantages of an air-cooled condenser include reductions in makeup water requirements, water vapor plumes, and cooling tower drift. The disadvantages of the air-cooled condenser are the land area requirements and high cost. The PPP site is not sufficiently large to use this alternative.

Condenser performance is inversely related to the temperature of the cooling medium. The local climate in the project area is characterized by high dry-bulb temperatures and low wet-bulb temperatures (i.e., low relative humidity). Consequently, the performance of an air-cooled condenser (which is inversely related to dry-bulb temperature) is poor compared to the performance of a surface condenser cooled by circulating water (which is inversely related to wet-bulb temperature). The air-cooled condenser's relatively poor performance results in relatively high steam turbine backpressure, which negatively impacts steam turbine output and efficiency. This negative impact causes a decrease in overall plant output and efficiency. The air-cooled condenser also uses more auxiliary power due to the greater number and horsepower of its fans as compared to the wet cooling tower. As a result, net plant output and efficiency are further reduced. In addition, the capital cost and land requirements of an air-cooled condenser greatly exceeds the cost of a surface condenser, circulating water system, and wet coolings.

The air-cooled condenser's disadvantages of reduced plant output, reduced plant efficiency, and higher capital costs were found to outweigh the advantage of reduced water consumption.